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COMPARATIVE STUDY OF ALBIAN MONOSULCATE ANGIOSPERM POLLEN GRAINS

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Abstract

Authors reviewed the diagnosis of the monosulcate and trichotomosulcate pollen of the early angiosperms in order to clear their nomenclatural problems and on the basis of their own material, revaluated the status of *Clavatipollenites, Retimonocolpites* and *Liliacidites*. Four new genera: *Brenneripollis* gen. nov., *Harskutipollis* gen. nov. and *Singhipollis* gen. nov. *Foveomonocolpites* gen. nov. are proposed. Nine new species are described and several new combinations are suggested. A new system for the early angiospermous pollen grains is proposed.

Key words: Palynology, Middle Cretaceous, angiosperm pollen, pollen taxonomy.

Introduction

Well-documented angiosperm pollen from the Cretaceous are important evidences of the time of appearance and adaptive radiation of the angiosperms. MULLER (1968), VAN CAMPO (1971), VAN CAMPO and LUGARDON (1973), DOYLE, VAN CAMPO and LUGARDON (1975) discovered the criteria distinguishing the most ancient angiospermous monosulcate pollen from the similarly monosulcate gymnospermoid ones.

The authors suppose that the Hungarian Albian-Cenomanian sediments have a significant role in the cognition of the early angiospermoid monosulcate pollen. The exact age of these layers is proved by geological and paleontological data (JUHÁSZ, 1983). In the different lithological formations of the Albian appeared in a great profusion of forms although not in a great number, all the monosulcate and tricolpate-tricolporoidate pollen types which are described from different sites of the world from the Barremian on. In addition to this, several new genera and new species were found in the authors'material. Their systematic description started not long ago (GÓCZÁN and JUHÁSZ, 1984; GÓCZÁN and JUHÁSZ, 1985; and this work as well.)

In this work the authors review the status of the monosulcate and trichotomosulcate angiosperm pollen which were classified by other authors into the formgenera *Clavatipollenites, Retimonocolpites, Liliacidites, Peromonolites, Asteropollis, Trichotomosulcites*. A great aid was given to us WALKER's (1976 a, b) publications. His study of 230 genera and 1000 species of recent primitive ranalean angiosperms greatly promoted understanding the aperture types of the pollen and the architecture of the pollen-walls.

The thickness of the nexine inside exine was considered to be a significant character in the systematic grouping the monosulcate-trichotomosulcate species. Several

forms has a characteristically thick or thin nexine which clearly separates them. In the descriptions of the pollen in the case of size the principles of LAING (1975, p. 779) and in the case of form and dimension that of WALKER and DOYLE (1975) were followed.

Systematic part

Genus: **Brenneripollis** gen. nov.

Synonyms: *Peromonolites* BRENNER 1963 (partim)
Liliacidites COUPER 1953 (partim)
Retimonoculpites PIERCE 1961 (partim)
Arecipites WODEHOUSE 1933 (partim)

Derivatio nominis: denominated after the palynologist G. J. BRENNER.
Type species: *Brenneripollis pellitus* gen. nov. et sp. nov.
Genusdiagnosis: Small and medium-sized, thin walled, monosulcate, tectate-reticulate pollen; the irregular reticulum of the sexine is often only loosely connected with the nexine. The sulcus is a simple, narrow slit, in most cases reaches from pole to pole with pointed extremities, it opens in the sexine and nexine in an identical form, although often not in the same level. The nexine is smooth, the sexine is reticulate. The infratectum of the sexine consists of bacula emerging to different heights from the nexine while the tectum consists of muri connecting the often thickened outer ends of the bacula, forming an irregularly shaped reticulum. The surface of the muri is often ornamented with coni or verrucae. Into this formgenus allocated as follows:

Brenneripollis pellitus gen. nov. et sp. nov.
Brenneripollis gracilis sp. nov.
Brenneripollis surensis sp. nov.
Brenneripollis peroreticulatus (BRENNER 1963) comb. nov.
Brenneripollis reticulatus (BRENNER 1963) comb. nov.
Brenneripollis tectus (NORRIS 1967) comb. nov.

Differential diagnosis: The sexine loosely connected with the nexine separates well *Brenneripollis* gen. nov. from the other thin-walled, tectate-reticulate, monosulcate pollen genera. So it differs from the closely related genus *Retimonocolpites* PIERCE 1961, which has a regular reticulum of uniform mesh size the lumina being uniformely distributed over the surface. The sexine of *Liliacidites* COUPER 1953 is closely connected with the nexine and the diameter of the lumina of the reticulum tends to diminish from the central part towards the poles.

Remarks: The characteristic reticulum of *Brenneripollis* gen. nov. and the relation of sexine/nexine, unambiguously distinguishes it from the other tectate-reticulate monosulcate genera. According to the authors these characters are sufficient and necessary to suggest the introduction of *Brenneripollis* gen. nov. for the fossil monosulcate pollen grains which are similar to *Peromonolites peroreticulatus* and *Peromonolites reticulatus*, described by BRENNER (1963) as new species from the Potomac Group of Maryland and which was considered by SINGH (1971) as *Liliacidites*, by DOYLE et al. (1975) as *Retimonocolpites*, and by JUHÁSZ and GÓCZÁN (1976) as *Arecipites*.

Brenneripollis pellitus gen. nov. et sp. nov.
(Plate I., Figs. 1—20)

Synonym: *Retimonocolpites* cf. *reticulatus* (BRENNER 1963) comb. nov.
DOYLE et al., 1975., p. 456., Pl. 5., Figs. 5—8.

Derivatio nominis: pellitus (Latin)=long-haired. The name refers to the sexine covering the nexine as a fur-coat.
Locus typicus: Súr, Borehole Súr-1., Mts Bakony.
Stratum typicum: 535.0—538.5 m. Tés Clay Formation, Middle Albian.
Holotype: Súr-1.: 535.6/2. Coordinates: 5.5-94.8. Plate I., Figs. 1—20.
Diagnosis: In polar view globose-euprolate, small and medium-sized monosulcate, tectate-reticulate pollen; the sexine is loosely connected with the nexine. Sulcus simple, narrow slit from pole to pole which opens in identical form in the sexine and in nexine. The nexine is about 1 μm thick, smooth, unstructured, decidedly separated from the sexine. The sexine is about 2 μm thick and structured. The columella layer of the infratectum is composed of 1.6—1.8 μm high, irregularly spaced bacula. The tectum consists of 0.3—0.6 μm wide muri connecting the ends of the bacula to an irregular reticulum. The surface of the muri is ornamented with microverrucae and coni which are smaller than 0.1 μm and are densely spaced. The reticulum is irregular, it covers the entire surface, diameter of the lumina of the microreticulum is 1.8—2.8 μm.

Dimensions: Polar diameter (PD): 20 μm, equatorial diameter (ED): 18 μm, length of the inner body (LB): 16 μm, breadth of the inner body (BB): 14 μm, exine thickness (et): 3 μm, sexine thickness (st): 2 μm, nexine thickness (nt): 1 μm, PD:ED=1.17, PD:et=6.6, st:nt=2, PD:re=7.1-11.1 (re=diameter of reticulum)

Differential diagnosis: *Brenneripollis pellitus* sp. nov. differs from the closely related *Brenneripollis reticulatus* (BRENNER 1963) comb. nov. by the smaller size and by the reticulum with lumina of larger diameter. From similarly sized *Brenneripolllis peroreticulatus* (BRENNER 1963) comb. nov. it differs by the reticulum with smaller lumina and by the ornaments of the muri. These two characteristics and the smaller size differentiate it from *Brenneripollis tectus* (NORRIS 1967) comb. nov. as well.

Remarks: Authors have the opinion that the specimen described by DOYLE et al. (1975, p. 146,., Pl. 5., Figs. 5—8) as *Retimonocolpites* cf. *reticulatus* (BRENNER 1963) comb. nov. (despite the 1—2 μm differences in size) can be sooner identified with *Brenneripollis pellitus* sp. nov. than with BRENNER's *P. reticulatus* — especially when the ultrastructure of the muri is also considered.

Occurrence: Transdanubian Central Range (Hungary): Tés Clay Formation, Middle Albian.

Brenneripollis gracilis sp. nov,
(Plate I., Figs. 21—42.)

Synonyms: *Liliacidites tectus* NORRIS, 1967, Pl. 16., Figs. 22—23.
Liliacidites tectus NORRIS, 1967; in SINGH, 1971, p. 190.
Pl. 29., Figs. 1—4.

Derivatio nominis: gracilis (Latin)=gracile.
Locus typicus: Tés, Borehole Tt—27., Mts Bakony.
Stratum typicum: 38.5 m, Tés Clay Formation, Middle Albian.
Holotype: Slide 35.5/2, coord. 4.3—105.4. Plate I., Figs. 21—42.

Diagnosis: In polar view globose-euprolate, small and medium-sized, monosulcate, tectate-reticulate pollen; the sexine of which is loosely connected with the nexine. The sulcus is a simple, narrow slit extending from pole to pole and tapered at both ends. It widens out sometimes in the central field and it opens in the sexine and in the nexine in the same level. The nexine is smooth, less than 1 μm thick, often it is similar to a body tending to separate in different degree from the sexine. Sexine thickness is between 0.8—1.8 μm and it has a reticulate structure. The columella consists of 0.8—1.8 μm high and 0.3—0.5 μm thick bacula spaced 1—2 μm apart, while the tectum consists of less then 1 μm thick muri connecting the ends of the bacula into an irregular reticulum. The reticulum covers the whole surface. Diameter of its lumina: 1—2 μm.

Dimensions: PD: 19—24 μm., ED: 12—16 μm, LB: 15—18 μm, BB: 9—12 μm, height of bacula about 0.8—1.8 μm, diameter of lumina of reticulum (re): 1—2 μm. PD:ED=1.6, PD:et=8.7—11.7, st:nt=2.4—3.6, PD:re=12—18.

Differential diagnosis: The new species is well differentiated from the other *Brenneripollis* species by the elongate-elliptical outline, the exine structure and the PD/ED index.

Remarks: Among the pollen grains described as *Liliacidites tectus* nov. sp. by NORRIS (1967) the specimens presented on Pl.16. Figs. 22—23. are closer related to *Brenneripollis gracilis* sp. nov. than to the type of *L. tectus* regarding form, dimensions, exine stratification. SINGH (1971) also published pollen which he considered as *Liliacidites tectus* NORRIS 1967 (Pl. 29., Figs. 1—4.) These are sooner *Brenneripollis gracilis* than *tectus*.

Occurrence: Transdanubian Central Range, Tés Clay Formation, Middle Albian.

Brenneripollis peroreticulatus (BRENNER 1963) comb. nov.
(Plate II., Figs. 1—15.)

Type and diagnosis: *Peromonolites peroreticulatus* n. sp., BRENNER, 1963, p. 94., Pl. 41., Figs. 1a-b.

Remarks: The specimen from the Lower Cenomanian of Pénzeskút Marl Formation is identical with the type species in form and structure, only it is 2—3 μm bigger. Pollen grains were published since BRENNER (1963) as species *peroreticulatus* by SINGH (1971, p. 188, Pl. 28, Figs 6—11), LAING (1975, p. 780, Pl. 93, Figs. 2—5), JUHÁSZ and GÓCZÁN (1976, p. 38, Pl. 1, Fig. 22), NORVICH and BURGER (1976, p. 146, Pl. 29, Figs. 9—13), DOYLE et al. (1977, p. 461., 462., Pl. 2, Figs. 7—8), MORGAN (1980, p. 38, Figs. 10, 15). Comparing these with the type species or with the specimens collected from the type layer it can be established that the large part of pollen grains from the Albian and Lower Cenomanian sediments does not belong to *Peromonolites peroreticulatus* but to one or more other species. Regarding palynostratigraphy as well as the problem of the origin of the ancient angiosperms it is a very important fact that from the Middle Cretaceous sediments of nearly all recent continents are already known (or can be expected) such monosulcate, semitectate-reticulate pollen which without any doubt belong to the relationship of this characteristic species.

Brenneripollis reticulatus (BRENNER 1963) comb. nov.
(Plate II., Figs. 16—30)

Type and diagnosis: Brenner 1963, p. 94, Pl. 41, Figs. 3, 4.

Remarks: Authors' specimens from the Middle Albian sediments of Tés Clay Formation and from the Upper Albian of the Pénzeskút Marl Fm. correspond the diagnosis of *Peromonolites reticulatus* BRENNER 1963 in form, size, and in the structure of the sulcus and reticulum. According to BRENNER the difference between *peroreticulatus* and *reticulatus* is that the generally smaller *peroreticulatus* has a reticulum with lumina of bigger diameter while the bigger-sized *reticulatus* has a reticulum with lumina of smaller diameter. BRENNER's observations were confirmed by DOYLE et al. (1975) on the basis of investigation of material collected from the type layer with the remark that there is a great variation within both groups. In the authors' material occur all variations in the relation to size of the pollen grains and the diameter of the lumina of the reticulum.

Brenneripollis surensis sp. nov.
(Plate IV., Figs. 1—12)

Derivatio nominis: denominated after the locus typicus.
Locus typicus: Súr, Borehole Súr-1.
Stratum typicum: 535.6—538.3 m. Tés Clay Fm., Middle Albian.
Holotype: Slide 535.6/1., coord. 36.0—96.8. Pl. IV., Figs. 1—12.

Diagnosis: In polar view globose-subprolate, small-sized, monosulcate, thin-walled, semitectate-reticulate pollen. The sulcus is a simple, reaching from pole to pole and opening in the sexine and in the nexine with identical form. Exine consists of a smooth, unstructured, thinner than 1.0 μm nexine and a 1.0 μm thick, structured sexine. The infratectum is composed of 0.8—1.2 μm high and 0.3—0.6 μm wide bacula spaced 0.8—1.2 μm apart. The tectum is constructed from muri thinner than 1 μm connecting the ends of the bacula to a reticulum. The reticulum is in general regularly hexagonal and covers the whole surface of the pollen grain. The diameter of the lumina is 0.8—1.2 μm, identical on the polar and on the central parts.

Dimensions: PD: 16 μm, ED: 13 μm, PD:ED=1.2, et=1.5—1.7 μm, PD:et=10, st:nt=1, PD:re=13—20.

Differential diagnosis: The new species differs from the other *Brenneripollis* species in size and proportions. It is most similar to *B. pellitus* in its contour and in the structure of the reticulum as well. Its much smaller size and much higher. PD: re value (in *B. pellitus* 7.1—11.1, in *B. surensis* 13—20) separates from this.

Remarks: *Brenneripollis surensis* sp. nov. shows the characteristics of the genus the sexine being loosely connected with the nexine, however, due to the small size this is not so conspicuous as at the bigger species.

Brenneripollis tectus (NORRIS 1967) comb. nov.
(Plate III., Figs. 1—35)

Type and diagnosis: NORRIS, 1967, p. 106, Pl. 16, Figs. 24—25.

Remarks: NORRIS (1967) mentioned in connection with *Liliacidites tectus* nov. sp. described by him that it is similar *Peromonolites reticulatus* BRENNER, but

differs from it by its wide sulcus, by its reticulum with lumina of bigger diameter and shorter pila and by a somewhat larger size. The photo of the type specimen of *L tectus* unambiguously shows the characteristics of *Brenneripollis* (reticulum of different size, sexine loosely connected with the nexine) and the lack of the determinant characteristics of *Liliacidites* COUPER 1953 (on the central part the diameter of lumina is bigger than at the poles); therefore this species can be considered as *Brenneripollis* without any doubt. The specimens on Plate 16, Figs. 22—23. and Plate 17, Figs. 1—2., presented by NORRIS (1967) are closer related to *Brenneripollis gracilis* nov. sp. than to the type of *tectus*, in the authors opinion. The authors present on Pl. III., Figs. 1—35 specimens from their material which in their opinion, can only be identified with *B. tectus* (NORRIS) comb. nov. from the *Brenneripollis* species described till now. The differences between NORRIS' diagnosis and the authors' specimens can be considered as variation within the species.

Occurrence: Vértessomló Aleurolite Formation, mamillatum zone, Lower Albian (Mts Vértes), and Tés Clay Fm., Middle Albian.

Genus: **Retimonocolpites** PIERCE 1961 emend.

Type species: *Retimonocolpites dividuus* nov. sp., PIERCE, 1961, p. 47,. Pl. III., Fig. 87;

Emended diagnosis: Medium-sized pollen grains with elliptic-subcircular contours from the polar aspect. Monosulcate, tectate-reticulate pollen, on which the delicate reticulum is more or less regular and the lumina have identical or nearly similar diameter on the whole surface. The sulcus in the sexine is a simple slit with a somewhat wider and more obscure area in the nexine. The nexine is smooth, the sexine is reticulate. The infratectum consists of identically high, uniformly spaced bacula, while the tectum consist of muri connecting the outer ends of the bacula forming a regular reticulum having lumina of more or less identical diameter throughout the whole surface.

Differential diagnosis: *Retimonocolpites* PIERCE 1961 emend. differs from the most closely related *Clavatipollenites* COUPER 1958 in the structure of the sexine. The tectum of *Retimonocolpites* consists of the muri connecting the ends of the bacula while that of *Clavatipollenites* is formed by the fused heads of clavae. It differs from *Liliacidites* COUPER 1953 and from *Brenneripollis* gen. nov. by the structure of the sexine as well: the columella layer of *Retimonocolpites* consists of uniformly spaced bacula of identical height while in case of the other two genera spacings and heights are different. Although tectum is formed by all the three genera from a reticulum, *Retimonocolpites* differs from that of the other two by its finer reticulum having lumina of the same size and equally spaced throughout the whole surface while at the other two genera the diameter of the lumina are various and their spacing is irregular.

Remarks: The diagnosis of PIERCE (1961) characterizing the genus and differentiating it from other known tectate-reticulate, monosulcate genera proved to be insufficient. Therefore the diagnosis is emended by authors as above-mentioned. On the basis of the description and Figures (Pl. III., Fig. 87) of the type species by PIERCE (1961), the literature on the subject, and of the authors' own material it seems to be evident that among the ancient angiospermous monosulcate pollen grains exists a group which differs from the genera *Liliacidites* COUPER 1953, *Clavatipollenites* COUPER 1958 as well as from *Brenneripollis* gen. nov., *Similipollis* GÓCZÁN et JUHÁSZ 1984, and *Harskutipollis* gen. nov.-as mentioned above. In the genus *Retimonocol-*

pites PIERCE 1961 emend. can be arranged the following species: most of the specimens of KEMP (1968) described as *Clavatipollenites rotundus* nov. sp.; the *Liliacidites dividuus* (PIERCE) BRENNER 1963 pollen grains of BRENNER (1963, p. 93., Pl. 40., Figs. 7—10), HEDLUND and NORRIS (1968, Pl. V., Fig. 9), the *Clavatipollenites* sp. (Pl. I., Figs. C, D, E, I) of DOYLE (1969), the specimens published as *Clavatipollenites hughesii* COUPER 1958 minutely examined and illustrated with excellent photos by DOYLE et al. (1975), moreover *Clavatipollenites rotundus* KEMP 1968 (Pl. 107., Fig. 14) from PLAYFORD's work (1971), the pollen as *Liliacidites rotundus* (KEMP 1968) comb. nov. by LAING (1975, p. 782. Pl. 9., Figs. 1—6) and the pollen identified as *Clavatipollenites* cf. *rotundus* by CHLONOVA (1977, p. 116, Pl. IX., Figs. 8—9). From these, on the new photos of 2000× magnification of type specimens of *Clavatipollenites rotundus* KEMP 1968 taken by LAING (1976, p. 24., Pl. 1., Figs. E—F), the structure of the sexine and the reticulum formed by the muri connecting the ends of the bacula can be seen most distinctly. PIERCE in the description of *R. dividuus* established that the reticulum is sometimes separated from the endexine; this might influence DOYLE putting *peroreticulatus* in this genus. In the authors' opinion this separatedness is surely not the original characteristic of the pollen grain because the columnar layer of the infratectum is not high, the separation probably occurred as the result of some mechanical pressure. This phenomenon can be frequently observed is separates of similar exemplar as well as that of other forms (e.g. on specimens of *Crassipollis* GÓCZÁN et JUHÁSZ). Enlarging the photo of PIERCE the traces of this can be seen clearly even by magnifying it to 1000×.

Retimonocolpites rotundus (KEMP 1968) comb. nov.
(Plate IV., Figs. 13—17.)

Type and diagnosis: KEMP, E. M. 1968, P. 424—426., Pl. 79. Figs. 17—19.

Remarks: From the Middle Albian sediments of Tés Clay Fm., monosulcate, semitectate-reticulate pollen grains were found which can be identified with this species on the basis of diagnosis and Figure of KEMP. The size of these specimens is smaller by some micrometers than that of the type but they fit in the variation of size of the species which were published by KEMP about reexposing and re-examining COUPER's type material. The thickness of the exine and lumina diameter corresponds to that of data published from the type, the data of sexine and nexine, however, show reciprocal values. On authors specimens the nexine is thicker and the sexine is thinner. However, KEMP (1968) also presents pollen grains having the same sexine: nexine relation: Pl. 79., Fig. 16 and p. 426. text-fig. 3.

Genus: **Harskutipollis** gen. nov.

Derivatio nominis: denominated after the place of occurrence of the type species, village Hárskút.

Type species: *Harskutipollis robustus* gen. nov. et sp. nov.

Genusdiagnosis: In polar view globose-prolate, medium-sized, thick-walled, tectate-reticulate, monosulcate pollen the nexine of which is more than twice as thick as that of the sexine. The sulcus is a simple slit extending in the longitudinal axis of the pollen grain, it pierces uniformely both layers of the exine and it does not form a field of dissolution in the nexine. The thick nexine forms most part of the exine

and a lesser extent is formed by the thin sexine. The nexine is smooth, unstructured, closely adheres to the sexine. The sexine is ornamented, tectate-reticulate. The infratectum consists of a baculate layer while the tectum of the muri connecting the outer ends of the bacula forming a reticulum. The reticulum covers the whole surface of the pollen grain, the lumen diameters are identical all over the surface.

Differential diagnosis: *Harskutipollis* gen. nov. differs from the most closely related *Retimonocolpites* PIERCE 1961, *Clavatipollenites* COUPER 1958 and *Liliacidites* COUPER 1953 by its thick exine and by the relation of sexine: nexine. The diameter of the lumina of reticulum are the same all over the surface and in this it differs from *Similipollis* GÓCZÁN et JUHÁSZ 1984 which has a thick exine but the diameters of the lumina are various. It is separated from the tectate-reticulate, thick-walled, trichotomosulcate *Oroszlanyipollis* GÓCZÁN et JUHÁSZ 1984 by the monosulcate aperture.

Harskutipollis robustus gen. nov. et sp. nov.
(Plate IV., Figs. 18—29)

Derivatio nominis: robustus (Latin)=robust, strong.
Locus typicus: Hárskút (Mts Bakony), Borehole Hk-4.
Stratum typicum: 133.7—135.1 m, grey aleurolite, Pénzeskút Marl Formation, Upper Albian.
Holotype: Slide 69-70/2, coord. 16.8-108.5. Pl. IV., Figs. 18—25.

Diagnosis: In polar view globose-prolate, medium-sized, thick-walled, tectate-reticulate, monosulcate pollen. The sulcus is a simple, long, towards the ends tapering and usually narrow slit running in the longitudinal axis which breaks uniformly through the layers of the exine and does not form a sculptured lytic area in the thick nexine. The exine is 2.8—3.0 μm thick and has an inner thicker, unstructured layer and an outer thinner ornamented one. The smooth nexine is about 2 μm thick and is closely connected to the sexine. The sexine is 0.8—1.0 μm thick, tectate-microreticulate. The infratectum consists of thick set bacula shorter than 1 μm, while the tectum is formed by muri connecting the outer ends of the bacula to a microreticulum. The reticulum covers uniformely the whole surface, the diameter of lumina is identical (0.4—0.6 μm) all over the surface.

Dimensions: PD: 26—30 μm, ED: 22—29 μm, et: 2.8—3 μm, PD:ED= 1.0—1.1, PD:et=8.6—10.7, st:nt=0.5.

Differential diagnosis: The new species is most similar to *Retimonocolpites dividuus* PIERCE 1961 and to *Retimonocolpites rotundus* (KEMP 1968) comb. nov. The thick exine, the PD:et value, and the sexine: nexine ratio well distinguishes it from both of them.

Occurrence: Pénzeskút Marl Fm, dispar-zone, Upper Albian.

Genus: **Clavatipollenites** COUPER 1958

Type species: *Clavatipollenites hughesii* nov. sp., COUPER, 1958, p. 159, Pl. 31, Figs. 21—22. New photos of type: LAING, 1975, p. 24, Pl. 1., Figs. A—B.

Remarks: Although COUPER (1958) gave differential diagnosis neither in the description of the genus nor in that of the type species, in the authors'opinion the characters of the genus are distinctly enumerated and expressed in the name of the

genus as well and therefore on the basis of these, it can easily be differentiated from the other tectate-reticulate, monosulcate genera. According to COUPER, *Clavatipollenites* is characterized by the unstructured nexine and the tectate sexine consisting of clavate elongations fusioned at their ends; this produce in topview a microreticulate structure. KEMP (1968, p. 424) emending and rewording the diagnosis of *Clavatipollenites hughesii* COUPER "... based on re-examination of specimens from COUPER's type sample" does not write about "clavae" but about bacula: "...sexine is formed of baculate projections..., which either remain discrete or fuse at their tips to form a microreticulum".

The authors consider that by this alteration KEMP essentially changed the diagnosis of COUPER. The difference between the reticulum from fused clavae and that of from muri connecting the ends of the bacula is essential and this essentiality was recognised in the diagnosis and emphasized in giving a name by COUPER. Whereas neither the observation of COUPER (1958) nor that of KEMP (1968) can be questioned, it must be accepted that on the type specimen of COUPER the reticulum is formed by fused heads of the clavae while on the specimens of KEMP by muri connecting the ends of the bacula. Their respective photos rather prove than disprove their descriptions. On the basis of these data authors took the view that into *Clavatipollenites* COUPER (1958) those tectate-reticulate, thin-walled, monosulcate grains can be arranged whose reticulum is formed by clavate projections which expand and fuse together at their tips and the lumina of the reticulum are of identical size throughout the whole surface. The tectate-reticulate, monosulcate grains of similar structure with thin nexine on which the lumina of reticulum have identical diameter but the reticulum is not formed by the fusion of the heads of clavae but by muri connecting the ends of the bacula, belong to the genus *Retimonocolpites* PIERCE 1961 emend.

Clavatipollenites hughesii COUPER 1958
(Plate V., Figs. 1—10)

Type species and diagnosis: COUPER, R. A., 1958., p. 159., Pl. 31, Figs. 21—22.

Remarks: From the Lower Albian of Vértessomló Aleurolite Fm. (Borehole Vst-5, 39.0 m), the Middle Albian of Tés Clay Fm. (Borehole Tés-27, 49.0 m) and from Upper Albian of Pénzeskút Marl Fm. (Borehole U-4, 44.0—45.0 m) authors get such monosulcate, semitectate pollen grains which on the basis of form, the structure of the sulcus and of the sexine, structure of microreticulum are considered to be identical with *Clavatipollenites hughesii* COUPER. Although due to the bad condition of the grains the essential genus characteristics of COUPER, i.e. the microreticulum consists of fused heads of clavae, cannot be unambiguously observed in light microscope, these pollen grains might be identified as *Cl. hughesii* COUPER 1958 on the basis of the dimensions given in the description and/or measured on the photos published but above all considering the diameter of the lumina of the reticulum. Between the grains considered by the authors as *Retimonocolpites* PIERCE 1961 and the grains identified as *Clavatipollenites hughesii* COUPER 1958 there is such a great similarity in form, size, in the structure of the sulcus and of the reticulum that the idea, belonging to the same formgenus, offers itself. But in the thickness of the exine and from this in the width of the "darkened zone" which follow the sulcus and first of all in the structure of the reticulum and in the diameter of the reticular lumina, the differences are so distinct that the authors consider justified to keep both genera.

Clavatipollenites minutus BRENNER 1963
(Plate V., Figs. 11—14)

Type species and diagnosis: BRENNER 1963, p. 95., Pl. 41., Figs. 8—9.

Remarks: Small-sized, very thin-walled, monosulcate pollen grains belong to this species. The clavae are often free or form an irregular reticulum.

Occurrence: They rank among the oldest angiosperm pollen grains of Hungary. In mamillatum-zone of Vértessomló Fm. they are only sporadic, in the substuderi-zone of Pénzeskút Fm. they are more frequent.

Clavatipollenites tenellis PHILLIPS et FELIX 1971
(Plate V., Figs. 15—19.)

Type species and diagnosis: PHILLIPS and FELIX, 1971, p. 466, Pl. XV., Figs. 19—21.

Remarks: Spherical, monosulcate pollen, with very slightly developed sulcus; size between 18—30 μm. The incomplete or more or less well-developed reticulum is formed by the fused heads of the clavae.

Occurrence: mamillatum-zone of Vértessomló Fm., rare. Tés Clay Fm. (Middle Albian), frequent.

Genus: **Singhipollis** gen. nov.

Derivatio nominis: named after the palynologist CH. SINGH.
Type species: *Singhipollis mircoreticulatus* gen. nov. et sp. nov.

Genusdiagnosis: Small and medium-sized, thin-walled, tectate-reticulate, trichotomosulcate pollen; amb spheroidal. Nexine unsculptured, sexine semitectate-columellate, sculpture microreticulate. Bacula spaced about 1 μm apart form a microreticulum being connected by muri. Muri regular-shaped and of uniform size all over the body. The three-armed sulcus narrowing toward the extremities reaches or almost reaches the equator. PD:et=14—19.

Differential diagnosis: *Singhipollis* gen. nov. can be easily separated from the other trichotomosulcate, reticulate angiospermous pollen by its thin exine and microreticulate surface. The semitectate-microreticulate sculpture differentiates it from the next related *Trichotomosulcites* COUPER 1953 which has also a thin exine and is also trichotomosulcate but its structure is verrucate, microgranulate- microfoveolate. *Singhipollis* gen. nov. is similar to *Oroszlanyipollis* GÓCZÁN et JUHÁSZ 1984 in outer contour and in semitectate-reticulate sexine but it differs from it by the thin exine and the sexine: nexine ratio.

Remarks: Pollen grains which can be arranged into this genus were described as *Apiculatisporites vulgaris* n. sp. by GROOT and GROOT (1962, p. 155., Pl. VI., Figs. 4—8) from the Upper Albian—Lower Cenomanian rocks of Portugal (Nazaré) and the same species was published by LAING (1976, p. 19., Pl. 2., Figs. E—F) from Middle Cenomanian rhotomangense-zone of England. SINGH (1971) described pollen grains as *Liliacidites trichotomosulcatus* nov. sp. (p. 191., Pl. 29, Figs. 5—7) which can be arranged into *Singhipollis* gen. nov. According to the authors' opinion the

structure and sculpture of the small and medium-sized, thin-walled, semitectate-microreticulate, trichotomosulcate pollen grains, moreover their narrow chronological age (from Middle Albian to Middle Cenomanian) and wide area of occurrence (Canada, England, Portugal, Hungary) justify to separate them from the apiculate pteridophyte spores as well as from the species of the monosulcate *Liliacidites* and the trichotomosulcate *Trichotomosulcites* which have nonreticulate exine. For them is suggested a new genus. The following species are transferred here to the genus

Singhipollis gen. nov.:
Singhipollis microreticulatus gen. nov. et sp. nov.
Singhipollis (al. *Apiculatisporites*) *vulgaris* (GROOT et GROOT 1962) comb. nov.
Singhipollis (al. *Liliacidites*) *trichotomosulcatus* (SINGH 1971) comb. nov.
Singhipollis (al. *Liliacidites*) *orbiculatus* (SINGH 1983) comb. nov.

Singhipollis microreticulatus gen. nov. et sp. nov.
(Plate V., Figs. 25—30)

Locus typicus: Tés, Borehole Tés-27.
Stratum typicum: 49.0 m, grey clayey-marl, Tés Clay Fm., Middle Albian.
Holotype: Slide 49/2, coord. 15.3—105.0. Plate V., Figs. 25—30.

Diagnosis: Small-sized, thin-walled, semitectate-microreticulate, trichotomosulcate pollen with spheroidal amb. The three-armed sulcus narrowing toward the extremities and reaching the equator is formed by the complete break-down of the exinal elements in the distal polar area. The exine is less than 2 μm thick. The nexine is smooth, unstructured, thinner than 1 μm. The sexine is sculptured. The infratectum is columellate, consisting of 0.5 μm high and 0.2—0.3 μm thick bacula, apart 0.3—0.4 μm. Height and distance of bacula is the same all over the surface. The tectum consists of 0.2—0.3 μm thich muri connecting the outer ends of the bacula forming a microreticulum. The diameter of the lumina in the microreticulum is identical all over the surface and do not surpasse 0.5 μm. Dimensions: Size: 16 μm, et = 1 μm, st:nt = 1.

Differential diagnosis: The new species differs from the closely related *Singhipollis vulgaris* (GROOT et GROOT 1962) comb. nov. by its smaller size, by the reticulum having lumina of smaller diameter and by the shorter and closer spaced bacula of the infratectum. The same characters differentiate it from *Singhipollis trichotomosulcatus* (SINGH 1971) comb. nov. the sides of which are more convex.

Genus: **Liliacidites** COUPER 1953 emend.

Type species: *Liliacidites kaitangataensis* nov. sp., COUPER, 1953, p. 56, Pl. 7., Fig. 97.

Emended diagnosis: In polar view irregularly boat-shaped or prolate, large and medium-sized, thin-walled, monosulcate, tectate-reticulate pollen, on which the diameters of lumina of the reticulum are larger in the central parts than at the ends. The sulcus opens in the sexine and in the nexine in an identical way, the sulcus is mostly a simple slit tapering at the ends. The nexine is smooth and the sexine is reticulate. The infratectum is formed by bacula emerging from the nexine, at the central part they stand farther from each other and are longer than at the polar parts where they are shorter and stand to each other nearer. The tectum consists of

a generally irregular reticulum which is formed by the muri connecting the sometimes swollen outer ends of the bacula. PD:et >15.

Differential diagnosis: *Liliacidites* COUPER 1953 emend. differs in the structure of its tectate-reticulate exine from the similar monosulcate angiosperm pollen *Arecipites* WODEHOUSE 1933 the sexine of which — as it was demonstrated by WODEHOUSE 1933 comparing "form and structure" of recent *Phoenix dactylifera* pollen with *Arecipites* — is tectate-microfoveolate (scrobiculate) and not reticulate. The differences between *Arecipites* and *Liliacidites* were minutely analysed NICHOLS et al. (1973). In *Clavatipollenites* COUPER 1958 the reticulum of the microreticulate sexine is formed by heads of the clavae and not by the muri connecting the ends of the bacula as in *Liliacidites*. In *Clavatipollenites* the lumina of reticulum are of identical diameter all over the surface while in *Liliacidites* they are different.

Liliacidites differs from *Retimonocolpites* by the infratectum which consists of bacula having identical height and being uniformly spaced. It differs from *Brenneripollis* gen. nov. in which the infratectum is loosely connected with the nexine and consists of different long, irregularly spaced bacula and as result of this the muri connecting their ends form an irregular reticulum having variously large lumina. It differs from *Similipollis* GÓCZÁN et JUHÁSZ 1984 in which the diameters of the lumina are also various but the diameter of the lumina diminishes dorsiventrally from the sulcus to to the proximal surface and not from the equator to the poles -as in the case of *Liliacidites*.

Harskutipolllis gen. nov. has a reticulum with lumina of identical diameter all over the whole surface and has a thick exine while the exine of *Liliacidites* is thin.

Remarks: COUPER (1953) in the genusdiagnosis of *Liliacidites* did not express unequivocally that the diameter of the lumina consistently diminishes from the central region toward the poles, he wrote only "... lumen of reticulum variable in size." Therefore it became necessary the emendation of the diagnosis of the genus, by which the species having more or less identically sized lumina all over the surface of the pollen will be excluded. This insufficiency of the genusdiagnosis could be the reason that some authors arrange in this genus types which differ from the type species of *Liliacidites*, as SINGH (1971) BRENNER's *P. peroreticulatus* and *P. reticulatus*, or LAING (1975) *Clavatipollenites* and *Retimonocolpites* species while others arrange pollen grains showing the characters of *Liliacidites* not in the reticulate but in the microfoveolate *Arecipites* WODEHOUSE, e.g. ANDERSON (1960) and KRUTZSCH ((1970). Even COUPER (1960) put in *Liliacidites* pollen grains which have a reticulum with lumina of identical size.

Liliacidites hungaricus sp. nov.
(Plate VI., Figs. 1—4)

Derivatio nominis: denominated after the occurrence in Hungary.
Locus typicus: Pénzesgyőr, Mts Bakony, Borehole Pgy-4.
Stratum typicum: 69.7 m. Grey glauconite marl. Pénzeskút Marl Fm., substuderizone, Upper Albian.
Holotype: Slide: Pgy-4., 69.7/2, coord. 31.7—117.9. Pl. VI., Figs. 1—4.

Diagnosis: In distal-polar view boat-shaped, elliptic, medium-sized, thin-walled, semitectate-reticulate, monosulcate pollen. The sulcus reaches from pole to pole, it is a simple slit opening widely at the central part and ending tapered in the polar

regions. The exine is thin, 1.8—2.0 μm. It consists of a smooth, unstructured, 0.8—1.0 μm thick nexine and a structured 1.0—1.2 μm thick sexine. The infratectum of the sexine is formed by 0.5—1.2 μm high bacula standing nearer to each other on the polar parts than in the centre. The tectum is formed by muri connecting the outer ends of the bacula with an irregular reticulum. Width of the muri is about 0.2—0.3 μm the diameter of the lumina is 2—3 μm at the central part and 1.0—1.5 μm in the polar regions.
Dimensions: PD: 36 μm, ED: 24 μm, PD:ED=1.5, PD:et=18—20, st:nt=1.2—1.25.

Differential diagnosis: The new species is similar to *Liliacidites inaequalis* SINGH 1971 but easily be differentiated from it by the smaller size of the lumina, by the more delicate reticulum and by thinner muri.
Occurrence: It has only be observed in the stratum typicum.

Liliacidites simplex sp. nov.
(Plate VI., Figs. 5—9)

Derivatio nominis: it refers to the simple structure.
Locus typicus: Vértessomló (Mts Vértes), Borehole Vst-5.
Stratum typicum: 72.0—73.0 m. Aleurolite. Vértessomló Fm., mamillatum-zone, Lower Albian.
Holotype: Slide: Vst-5, 73.2/2., coord. 37.2—111.1., Pl. VI., Figs. 5—9.

Diagnosis: In polar view boat-shaped, oblong, medium-sized, thin-walled, semitectate-reticulate, monosulcate pollen. The sulcus is a very simple, thin slit reaching from pole to pole. Exine is thin, 1.0—1.5 μm, nexine smooth. The infratectum consists of 0.3—0.4 μm high bacula connected by irregularly shaped muri forming a reticulum with narrow lumina. On some places the reticulum is imperfect.
Dimensions: PD: 29 μm, ED: 18 μm, PD:ED=1.5, PD:et=26—28, st:nt=1.

Differential diagnosis: *Liliacidites simplex* sp. nov. differs from the other *Liliacidites* species by its smaller size, by simpler slit-like sulcus, by the often imperfect reticulum with the smaller lumina which, however, similarly to that of the other *Liliacidites* species further diminishes towards the poles.
Occurrence: This species is one of the most ancient angiospermous pollen grains from Hungarian Albian sediments. Vértessomló Aleurolite Formation, mamillatum-zone, Lower Albian.

Genus: **Trichotomosulcites** COUPER 1953 emend.

Type species: *Trichotomosulcites subgranulatus* COUPER 1953.

Emended diagnosis: Small and medium-sized, relatively thin-walled tectate-columellate, non-reticulate, trichotomosulcate pollen. Amb spheroidal. The nexine unsculptured, the sexine is sculptured by granulate, verrucate and microfoveolate elements. The three-armed sulcus is wide, reaching to the equator; often ornamented with granula, verrucae.

Differential diagnosis: This genus separated from other trichotomosulcate, thin-walled genera by it non-reticulate (granulate, verrucate, microfoveolate) ornamentation.

Trichotomosulcites maior sp. nov.
(Plate VI., Figs. 10—12)

Locus typicus: Olaszfalu (Mts Bakony). Borehole Ot-84.
Stratum typicum: 16.0 m. Clayey-marl. Tés Clay Fm. Middle Albian.
Holotype: Slide: Ot-84, 16/2., coord. 34.1—104.2. Pl. V., Figs. 10—12.

Diagnosis: Rounded-triangular, trichotomosulcate pollen. The sulcus forms a triangular arch reaching nearly to equator. Exine is 2 μm thick, the ratio sexine: nexine = 1, they are scarcely differentiated. The area of three-armed sulcus is ornamented by granula, the other part of pollen grain is microfoveolate.
Height of granula: 0.3—0.5 μm, size of microfoveolae: height: 0.6—0.8 μm, width: 0.2—0.3 μm.
Dimensions: PD: 40—42 μm, ED: 39—41 μm, length of the sulcus: 22—24 μm, its thickness is 1.5 μm.

Differential diagnosis: The new species differs from *Trichotomosulcites subgranulatus* COUPER 1953, *Trichotomosulcites waronuiensis* COUPER 1953 and *Trichotomosulcites contractus* ANDERSON 1960 by its larger size, thicker exine and by particularly granulate, mostly microfoveolate ornamentation. The other trichotomosulcate species (from genera *Oroszlanyipollis* GÓCZÁN et JUHÁSZ 1984, *Singhipollis* gen. nov.) are reticulate form.
Occurrence: Pénzeskút Marl Formation, Upper Albian.

Genus: **Foveomonocolpites** gen. nov.

Type species: *Foveomonocolpites pereensis* gen. nov. et sp. nov.

Genusdiagnosis: Monosulcate angiosperm pollen grains with strongly elongated, boat-shaped contour and narrow sulcus. The exine is tectate-perforate, moderately thick. The ratio of sexine: nexine = 1. The sexine has a microfoveolate-microfoveoreticulate ornamentation.

Differential diagnosis: *Foveomonocolpites* gen. nov. differs from the other monosulcate, thin-walled early angiospermous pollen genera by its non-reticulate, microfoveolate sculpture and by its elongated, boat-shaped, "magnoliid-type" form. The *Arecipites* WODEHOUSE 1933 is also microfoveolate (scrobiculate) but a form of the Palmae-type. *Foveomorphomonocolpites* SOLE de PORTA 1971 differs from the new genus by its less prolate contours and thicker wall.

Foveomonocolpites pereensis gen. nov. et sp. nov.
(Plate VI., Figs. 13—18)

Derivatio nominis: after the village Pere, Bakony Mts. (Hungary).
Locus typicus: Pere, Borehole Pe-27.
Stratum typicum: 126.0 m, grey-marl, Pénzeskút Fm., Lower Cenomanian.
Holotype: Slide: Pe-27, 126/2., coord. 35.2—108.4. Pl. VI., Figs. 13—18.

Diagnosis: Very elongated, boat-shaped, large-sized, monosulcate pollen. The sulcus reaches from pole to pole, it is thin, hardly opened. Exine is about 1 μm thick and perforated by microfoveolae of 0.5 μm in diameter. The microfoveolae are densely spaced and therefore the sculpture of the pollen has a microfoveolate-microreticulate character.
Dimensions: PD: 77 μm, ED: 29 μm, PD:ED = 2.1—2.5, length of sulcus: 65 μm.

Differential diagnosis: The new species differs from the monosulcate angiospermous pollen grains described until now from the Barremian up to the Cenomanian by its peculiar sculpture, with its very large size and its characteristic form similar to that of the recent magnoliid pollen grains.

Occurrence: Up till now it was observed only in sediments of mantelli-zone of Pénzeskút Marl Formation (Lower Cenomanian).

A new system of the early monosulcate-trichotomosulcate angiosperm pollen grains

Turma: **Archaeangiospermae** nov. turma
(Mono- et trichotomosulcate primarum Angiospermarum)

1. Subturma: *Crassinexines* nov. subturma
1.1. Infraturma: *Crassinexines-Reticulati* nov. infraturma
1.1.1. Subinfraturma: *Crassinexines-Retimonosulcati* nov. subinfraturma
1.1.1.1. Forma Genus: *Similipollis* GÓCZÁN et JUHÁSZ 1984
1.1.1.1.1. Forma Species: *Similipollis varireticulatus* GÓCZÁN et JUHÁSZ 1984
1.1.1.1.2. Forma Species: *S. orbiculatus* GÓCZÁN et JUHÁSZ 1985
1.1.1.2. Forma Genus: *Harskutipollis* nov. genus
1.1.1.2.1. Forma Species: *Harskutipollis robustus* nov. sp.
1.1.2. Subinfraturma: *Crassinexines-Reticulotrichotomosulcati* nov. subinfraturma
1.1.2.1. Forma Genus: *Oroszlanyipollsi* GÓCZÁN et JUHÁSZ 1984
1.1.2.1.1. Forma Species: *Oroszlanyipollis grandis* GÓCZÁN et JUHÁSZ 1984
1.1.2.1.2. Forma Species: *Oroszlanyipollis baconicus* GÓCZÁN et JUHÁSZ 1985
1.1.2.1.3. Forma Species: *O. saparensis* GÓCZÁN et JUHÁSZ 1985
1.2. Infraturma: *Crassinexines-Nonreticulati* nov. infraturma
1.2.1. Subinfraturma: *Crassinexines-Nonreticulomonosulcati* nov. subinfraturma
1.2.1.1. Forma Genus: *Crassipollis* GÓCZÁN et JUHÁSZ 1984
1.2.1.1.1. Forma Species: *Crassipollis pusztavamensis* GÓCZÁN et JUHÁSZ 1984
1.2.1.1.2. Forma Species: *Cr. deakae* GÓCZÁN et JUHÁSZ 1984
1.2.1.1.3. Forma Species: *Cr. vraconicus* GÓCZÁN et JUHÁSZ 1984
1.2.1.1.4. Forma Species: *Cr. ovalis* GÓCZÁN et JUHÁSZ 1984
1.2.1.1.5. Forma Species: *Cr. vertesensis* GÓCZÁN et JUHÁSZ 1984
1.2.1.1.6. Forma Species: *Cr. dissimilis* GÓCZÁN et JUHÁSZ 1984
1.2.1.1.7. Forma Species: *Cr. minor* GÓCZÁN et JUHÁSZ 1984
1.2.1.1.8. Froma Species: *Cr. urkutensis* GÓCZÁN et JUHÁSZ 1985
1.2.1.1.9. Forma Species: *Cr. noszkyii* GÓCZÁN et JUHÁSZ 1985
1.2.1.1.10. Forma Species: *Cr. magnus* GÓCZÁN et JUHÁSZ 1985
1.2.1.1.11. Forma Species: *Cr. minimus* GÓCZÁN et JUHÁSZ 1985
1.2.1.1.12. Forma Species: *Cr. pyriformis* GÓCZÁN et JUHÁSZ 1985
1.2.1.1.13. Forma Species: *Cr. longisulcatus* GÓCZÁN et JUHÁSZ 1985
1.2.1.1.14. Forma Species: *Cr. tesensis* GÓCZÁN et JUHÁSZ 1985
2. Subturma: *Tenuinexines* nov. subturma
2.1. Infraturma: *Tenuinexines-Reticulati* nov. infraturma
2.1.1. Subinfraturma: *Tenuinexines-Reticulomonosulcati* nov. subinfraturma

2.1.1.1. Forma Genus: *Brenneripollis* nov. gen.
2.1.1.1.1. Forma Species: *Brenneripollis pellitus* nov. sp.
2.1.1.1.2. Forma Species: *Br. gracilis* nov. sp.
2.1.1.1.3. Forma Species: *Br. surensis* nov. sp.
2.1.1.1.4. Forma Species: *Br. peroreticulatus* (BRENNER 1963) comb. nov.
2.1.1.1.5. Forma Species: *Br. reticulatus* (BRENNER 1963) comb. nov.
2.1.1.1.6. Forma Species: *Brenneripollis textus* (NORRIS 1967) comb. nov.
2.1.1.1.7. Forma Species: *Br. crassatus* (SINGH 1971) comb. nov.
2.1.1.2. Forma Genus: *Retimonocolpites* PIERCE 1961. emend.
2.1.1.2.1. Forma Species: *Retimonocolpites dividuus* PIERCE 1961
2.1.1.2.2. Forma Species: *R. rotundus* (KEMP 1968) comb. nov.
2.1.1.2.3. Forma Species: *R. fragilis* PIERCE 1961
2.1.1.3. Forma Genus: *Liliacidites* COUPER 1953 emend.
2.1.1.3.1. Forma Species: *Liliacidites kaitangataensis* COUPER 1953
2.1.1.3.2. Forma Species: *L. variegatus* COUPER 1953
2.1.1.3.3. Forma Species: *L. intermedius* COUPER 1953
2.1.1.3.4. Forma Species: *L. giganteus* SINGH 1983
2.1.1.3.5. Forma Species: *L. magnus* SINGH 1983
2.1.1.3.6. Forma Species: *L. lenticularis* SINGH 1983
2.1.1.3.7. Forma Species: *L. dictyotus* SINGH 1983
2.1.1.3.8. Forma Species: *L. tectatus* SINGH 1983
2.1.1.3.9. Forma Species: *L. hungaricus* nov. sp.
2.1.1.3.10. Forma Species: *L. simplex* nov. sp.
2.1.1.4. Forma Genus: *Clavatipollenites* COUPER 1958
2.1.1.4.1. Forma Species: *Clavatipollenites hughesii* COUPER 1958
2.1.1.4.2. Forma Species: *Cl. minutus* BRENNER 1963
2.1.1.4.3. Forma Species: *Cl. tenellis* PHILLIPS et FELIX 1971
2.1.1.4.4. Forma Species: *Cl. clavatus* (SINGH 1971) comb. nov.
2.1.1.4.5. Forma Species: *Cl. incisus* CHLONOVA 1977
2.1.1.5. Forma Genus: *Stellatopollis* DOYLE 1975
2.1.1.5.1. Forma Species: *Stellatopollis barghoornii* DOYLE 1975
2.1.1.5.2. Forma Species: *Stellatopollis largissimus* SINGH 1983
2.1.2. Subinfraturma: *Tenuinexines-Reticulotrichotomosulcati* nov. subinfraturma
2.1.2.1. Forma Genus: *Singhipollis* nov. gen.
2.1.2.1.1. Forma Species: *Singhipollis microreticulatus* nov. sp.
2.1.2.1.2. Forma Species: *Singhipollis vulgaris* (GROOT et GROOT 1962) comb. nov.
2.1.2.1.3. Forma Species: *Singhipollis trichotomosulcatus* (SINGH 1971) comb. nov.
2.1.2.1.4. Forma Species: *Singhipollis orbiculatus* (SINGH 1971) comb. nov.
2.2. Infraturma: *Tenuinexines-Nonreticulati* nov. infraturma
2.2.1. Subinfraturma: *Tenuinexines-Nonreticulomonosulcati* nov. subinfraturma
2.2.1.1. Forma Genus: *Transitoripollis* GÓCZÁN et JUHÁSZ 1984
2.2.1.1.1. Forma Species: *Transitoripollis anulisulcatus* GÓCZÁN et JUHÁSZ 1984
2.2.1.1.2. Forma Species: *Tr. similis* GÓCZÁN et JUHÁSZ 1984
2.2.1.1.3. Forma Species: *Tr. praesimilis* GÓCZÁN et JUHÁSZ 1984
2.2.1.1.4. Forma Species: *Tr. vulgaris* GÓCZÁN et JUHÁSZ 1985
2.2.1.1.5. Forma Species: *Tr. ovalis* GÓCZÁN et JUHÁSZ 1985

2.2.2. Subinfraturma: *Tenuinexines-Nonreticulotrichotomonosulcati* nov. subinfraturma
2.2.2.1. Forma Genus: *Trichotomosulcites* COUPER 1953 emend.
2.2.2.1.1. Forma Species: *Trichotomosulcites subgranulatus* COUPER 1953
2.2.2.1.2. Forma Species: *Trichotomosulcites contractus* ANDERSON 1960
2.2.2.1.3. Forma Species: *Trichotomosulcites maior* nov. sp.
2.3. Infraturma: *Tenuinexines-Foveolati* nov. infraturma
2.3.1. Subintrafturma: *Tenuinexines-Foveomonosulcati* nov. subinfraturma
2.3.1.1. Forma Genus: *Foveomonocolpites* nov. gen.
2.3.1.1.1. Forma Species: *Foveomonocolpites pereensis* nov. sp.
2.3.1.2. Forma Genus: *Arecipites* WODEHOUSE 1933
2.3.1.2.1. Forma Species: *Arecipites punctatus* WODEHOUSE 1933

Plate I.

1—20 *Brenneripollis pellitus* nov. gen. et nov. sp. (genotype)
Súr, Bore Súr-1., 535.6—538.5 m, "munieria" marl. Tés Clay Formation, Middle Albian.
Slide: 535/2, coord.: 5.5—94.8. Figs. 1—15=1000×, 16—18=2000×, 19—20=3000×.
21—31 *Brenneripollis gracilis* nov. sp. (holotype)
Tés, Bore Tt-27., 38.5 m. Tés Clay Formation, Middle Albian
Slide: 38.5/2, coord.: 4.3—105.5.
32—42 *Brenneripollis gracilis* nov. sp. (paratype)
Súr, Bore Súr-1., 526.8—529 m. Tés Clay Formation.
Slide: 526/1., coord.: 6.5—100.7.

Plate II.

1—10 *Brenneripollis peroreticulatus* (BRENNER 1963) nov. comb.
Olaszfalu, Bore Pe-31., 127.0—128.0 m. Pénzeskút Marl Formation, bergeri-subzone. Upper Albian. Slide: 127/1., coord.: 19.7—105.5.
11—15 *Brenneripollis peroreticulatus* (BRENNER 1963) nov. comb.
Úrkút, Bore U-421., 341.2 m. Upper part of Tés Clay Fm.
Slide: 341.2/1., coord.: 32.9—102.4.
16—20 *Brenneripollis reticulatus* (BRENNER 1963) nov. comb.
Balinka, Bore Ba-288., 602.0 m. Tés Clay Fm. Middle Albian.
Slide: 602/1., coord.: 15.8—100.4.
21—25 *Brenneripollis reticulatus* (BRENNER 1963) nov. comb.
Balinka, Bore Ba-288., 602.0 m. Tés Clay Fm. Middle Albian.
Slide: 602/1., coord.: 9.9—104.2.
26 *Brenneripollis reticulatus* (BRENNER 1963) nov. comb.
Pénzesgyőr, Bore Pgy-4., 69.7. Pénzeskút Marl Fm., inflatum-zone, Upper Albian.
Slide: 69.7/1. coord.: 36.5—95.0.
27—30 *Brenneripollis reticulatus* (BRENNER 1963) óov. comb.
Olaszfalu, Bore Ot-84., 80.0 m, Tés Clay Fm. Middle Albian.
Slide: 80/1., coord.: 39.7—111.5.

Plate III.

1—7 *Brenneripollis tectus* (NORRIS 1967) nov. comb.
Vértessomló. Bore Vst-5., 50.0—51.5 m. Vértessomló Aleurolite Formation,mammilatum-zone, Lower Albian.
Slide: 50/1., coord.: 7.4—105.6.
8—15 *Brenneripollis tectus* (Norris 1967) nov. comb.
Súr, Bore Súr-1., 545.8—547.1 m. Tés Clay Fm. Middle Albian.
Slide: 545/1., coord.: 15.5—93.7.
16—25 *Brenneripollis tectus* (NORRIS 1967) nov. comb.
Súr, Bore Súr-1., 533.0—533.6 m. Tés Clay Fm. Middle Albian.
Slide: 533/1., coord.: 6.3—93.6.

26—35 *Brenneripollis tectus* (NORRIS 1967) nov. comb.
Vértessomló, Bore Vst-4., 181.0 m. Vértessomló Aleurolite Fm., mammilatum-zone, Lower Albian.
Slide: 181/1., coord.: 14.8—93.8.

Plate IV.

1—12 *Brenneripollis surensis* nov. sp. (holotype)
Súr, Bore Súr-1., 538.8 m. Tés Clay Fm. Middle Albian.
Slide: 538.8/3., coord.: 36.0—96.8.
13—17 *Retimonocolpites rotundus* (KEMP 1968) nov. comb.
Súr, Bore Súr-1., 553.6 m. Tés Clay Fm. Middle Albian.
Slide: 553/1., coord.: 18.5—101.0.
18—25 *Harskutipollis robustus* nov. sp. (holotype)
Hárskút, Bore Hk-4., 133.0—135.1 m. Pénzeskút Marl Fm., dispar-zone, Upper Albian.
Slide: 69—70/2., coord.: 16.8—108.6.
26—29 *Harskutipollis robustus* nov. sp. (paratype)
Hárskút, Bore Hk-4., 127.0 m. Pénzeskút Marl Fm., dispar-zone, Upper Albian.
Slide: 19/4., coord.: 8.0—104.

Plate V.

1—5 *Clavatipollenites hughesii* COUPER 1958
Tés, Bore Tt-27., 49.0 m. Tés Clay Fm. Middle Albian.
Slide: 49/2., coord.: 20.4—102.8.
6—10 *Clavatipollenites hughesii* COUPER 1958
Úrkút, Bore U-4., 44.0—45.0 m. Pénzeskút Marl Fm., bergeri-subzone. Upper Albian.
Slide: U/2-2., coord.: 7.3—117.8.
11—12 *Clavatipollenites minutus* BRENNER 1963
Vértessomló, Bore Vst-5., 44.5 m. Vértessomló Aleurolite Fm., mammilatum-zone Lower. Albian.
Slide: 44.5/1, coord.: 7.1—92.
13 *Clavatipollenites minutus* BRENNER 1963
Olaszfalu, Bore Ot-83., 30.0 m. Tés Clay Fm. Middle Albian.
Slide: 30/3., coord.: 32.1—100.2.
14 *Clavatipollenites* cf. *minutus*
Pénzesgyőr, Bore Pgy-4., 69.7 m. Pénzeskút Marl Fm., bergeri subzone, Upper Albian.
Slide: 69.7/9, coord.: 7.2—94.1.
15 *Clavatipollenites tenellis* PHILLIPS et FELIX 1971
Csehbánya, Bore Cseh-13., 263.0 m. Tés Clay Fm. Middle Albian.
Slide: 263/3., coord. 12.1—110.6.
16—19 *Clavatipollenites tenellis* PHILLIPS et FELIX 1971
Tés, Bore Tt-27., 49.0 m. Tés Clay Fm. Middle Albian.
Slide: 49/2., coord.: 14.4—103.3.
20—24 *Clavatipollenites tenellis* PHILLIPS et FELIX 1971
Vértessomló, Bore Vst-4. 87.0 m. Vértessomló Aleurolite Fm., mammilatum-zone, Lower Albian.
Slid e: 87/3., coord.: 19.0—94.3.
25—30 *Singhipollis microreticulatus* nov. gen. et nov. sp. (holotype)
Tés, Bore Tt-27., 49.0 m. Tés Clay Fm. Middle Albian.
Slide: 49/2., coord.: 15.3—105.0.

Plate VI.

104 *Liliacidites hungaricus* nov. sp. (holotype)
Pénzesgyőr, Bore Pgy-4., 69.7 m. Pénzeskút Marl Fm., substuderi-zone. Upper Albian.
Slide: 69.7/2., coord.: 31.7—117.9.
5 *Liliacidites simplex* nov. sp. (holotype)
Vértessomló, Bore Vst-5., 72.0—73.2 m. Vértessomló Aleurolite Fm., mammilatum-zone. Lower Albian.
Slide: 73.2/2., coord.: 37.2—111.1.
10—12 *Trichotomosulcites maior* nov. sp. (holotype)
Olaszfalu, Bore Ot-84., 16.0 m. Tés Clay Fm. Middle Albian.
Slide: 16/2., coord.: 34.1—104.2.
13—16 *Foveomonocolpites pereensis* nov. sp. (holotype)
Olaszfalu, Bore Pe-27., 56.7 m. Pénzeskút Marl Fm., mantelli-zone. Lower Cenomanian.

Plate I

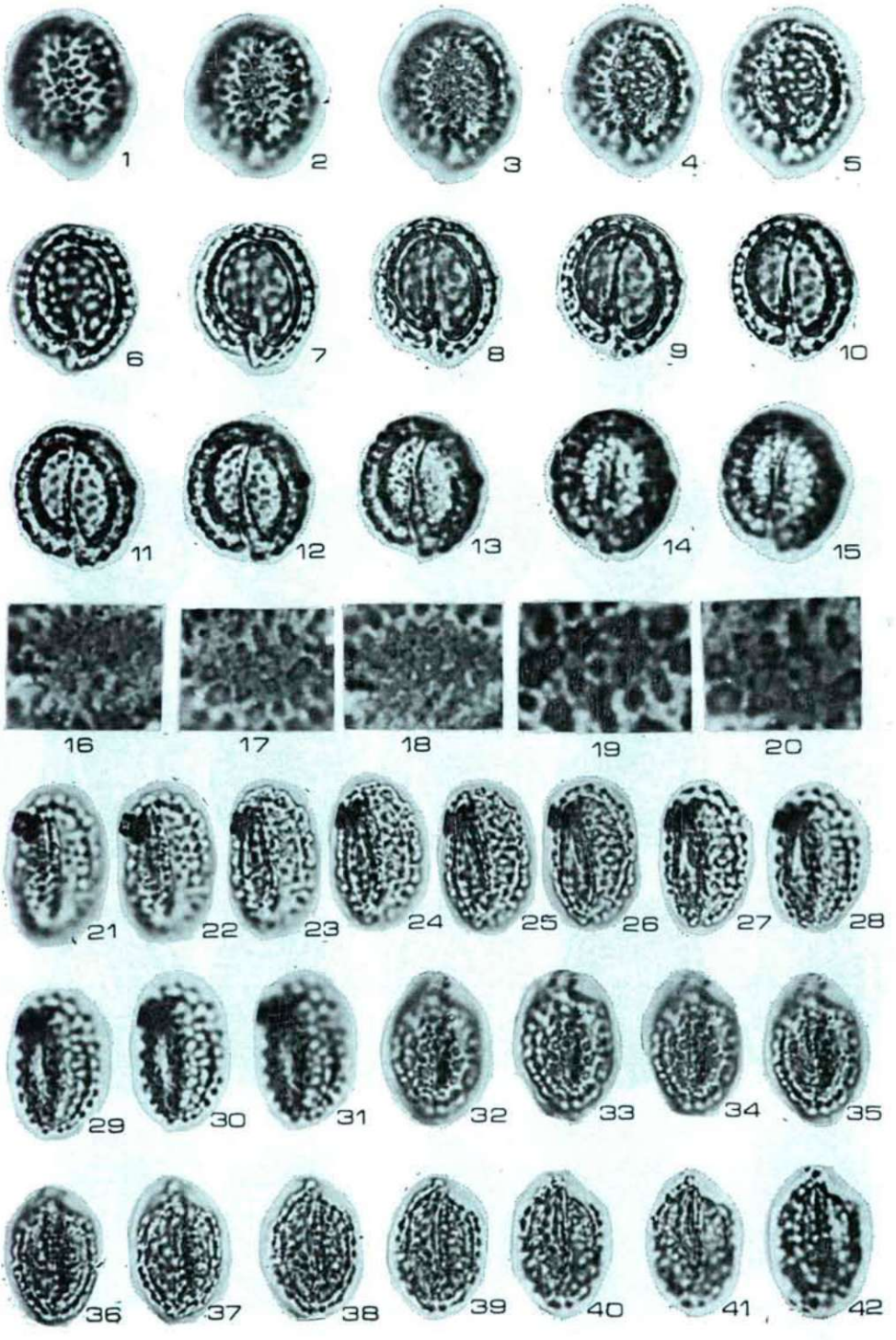
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Plate II

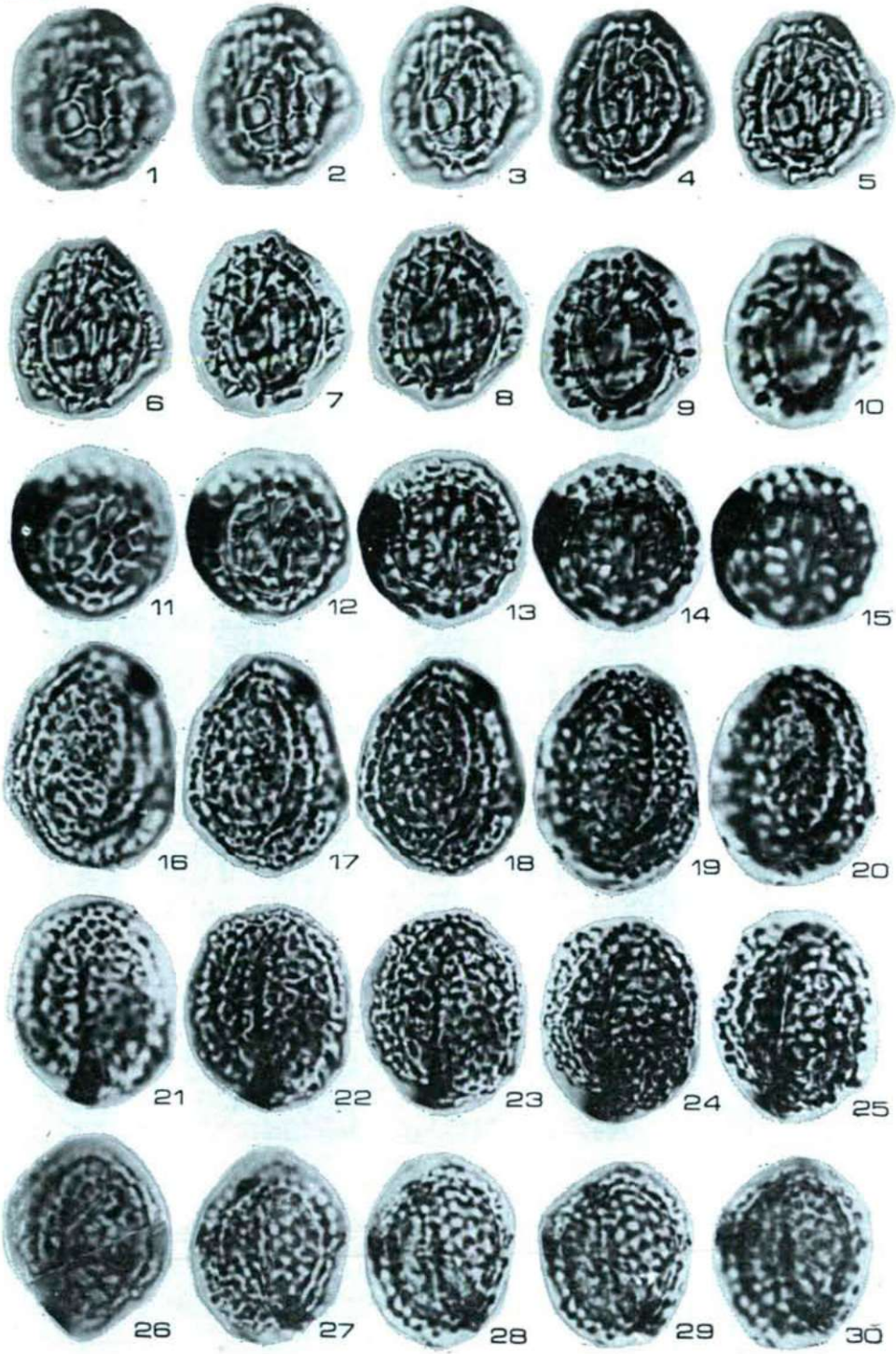
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Plate III

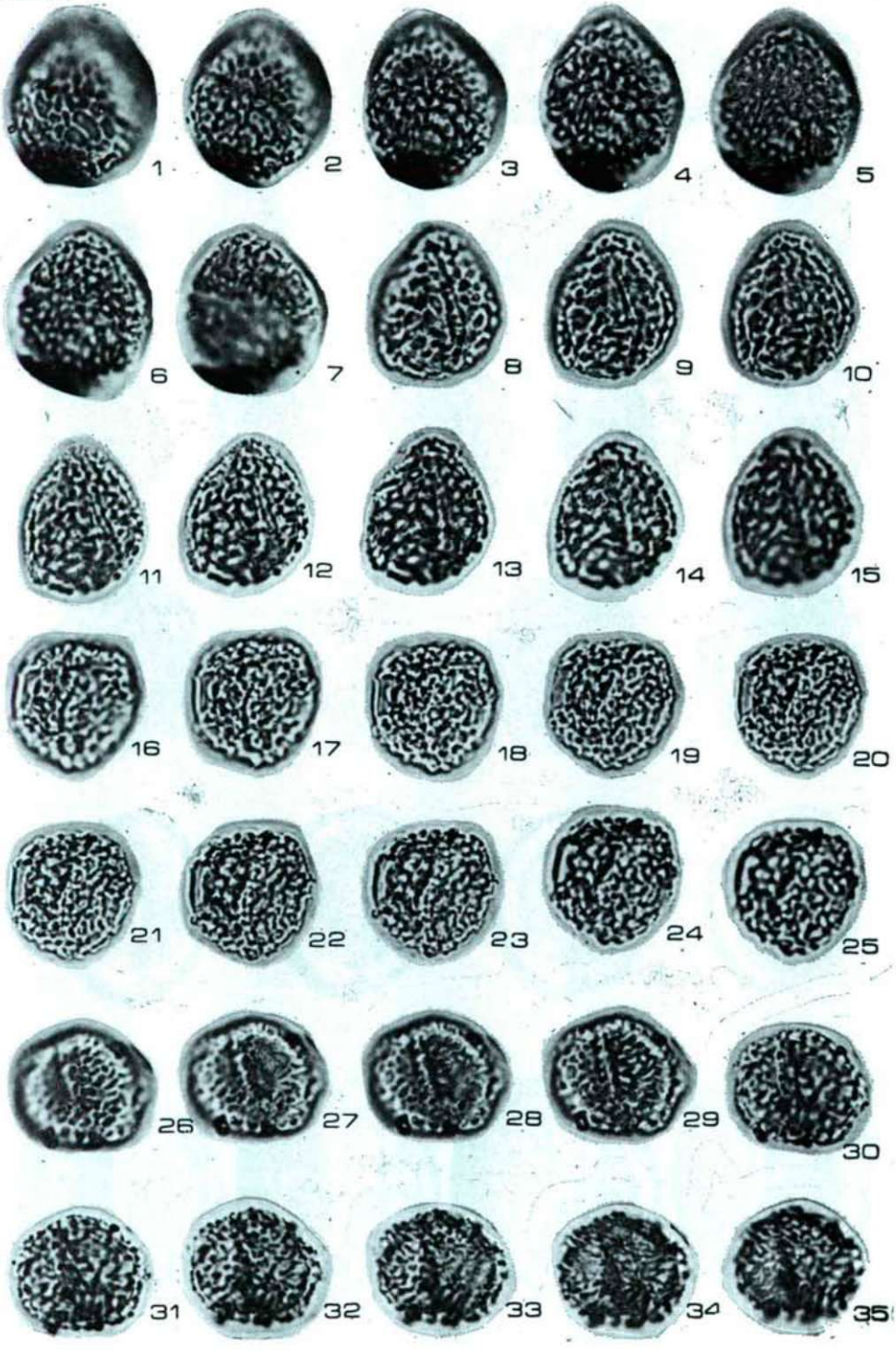
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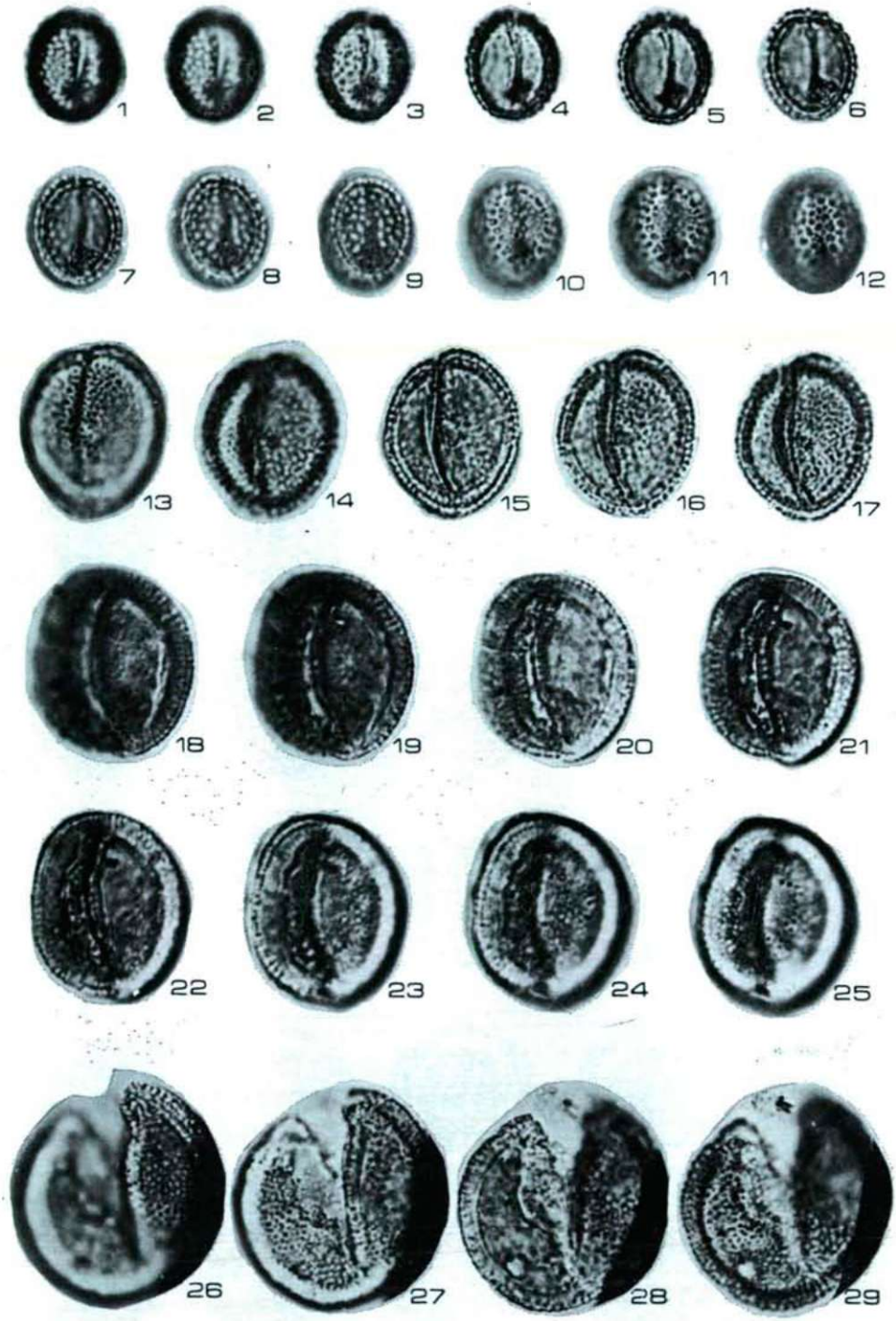
Plate IV



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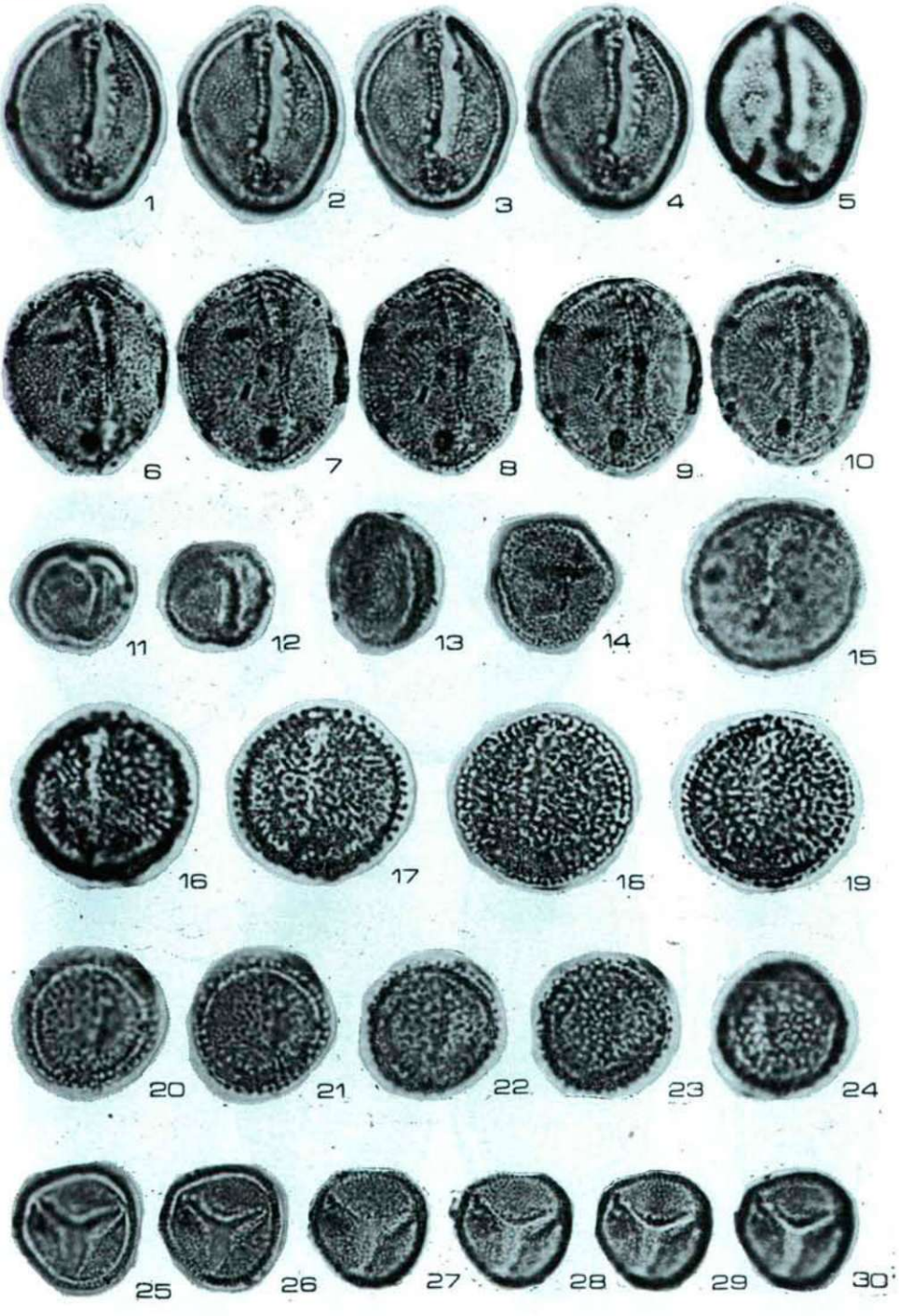
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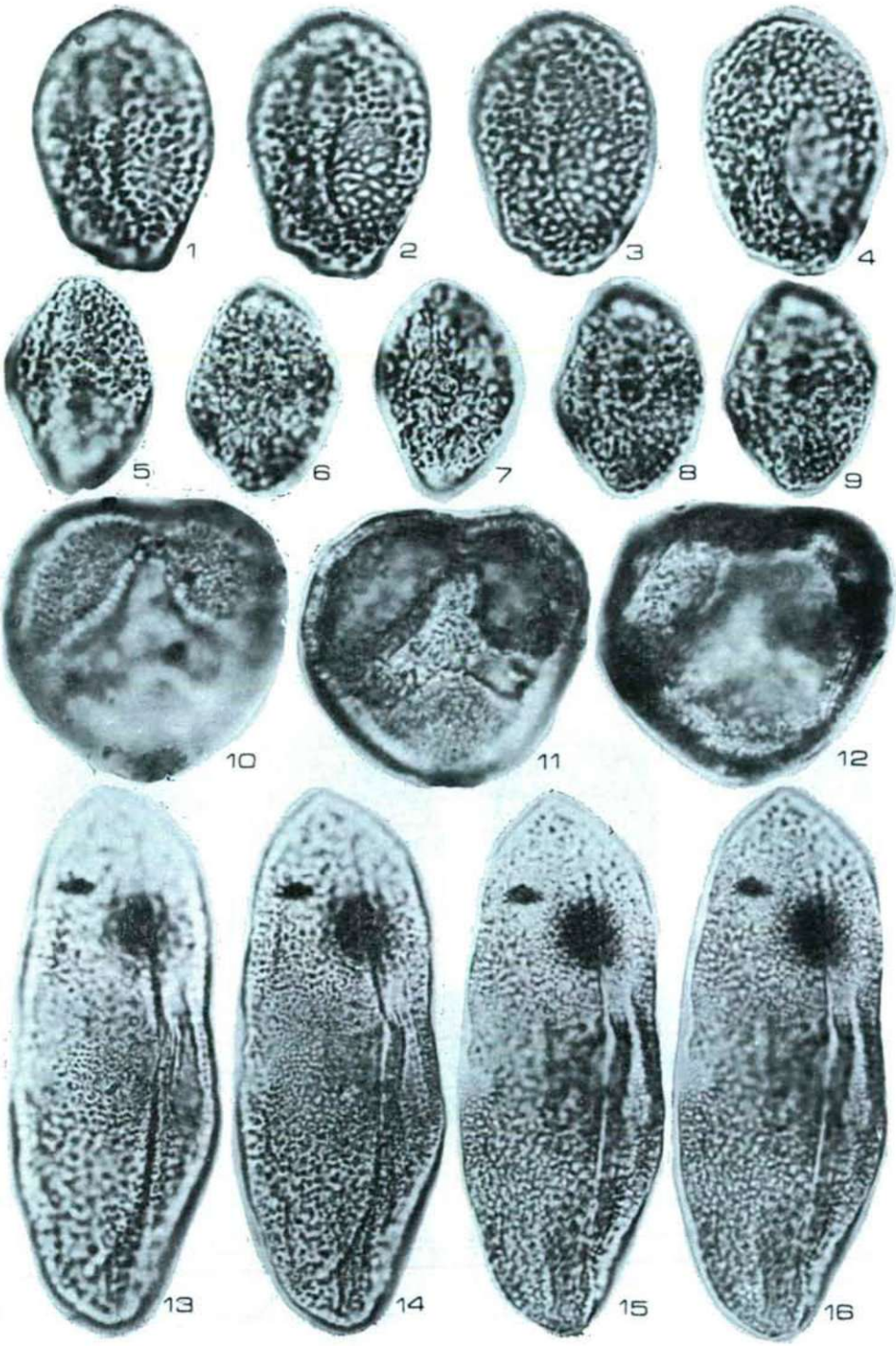
Plate VI



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